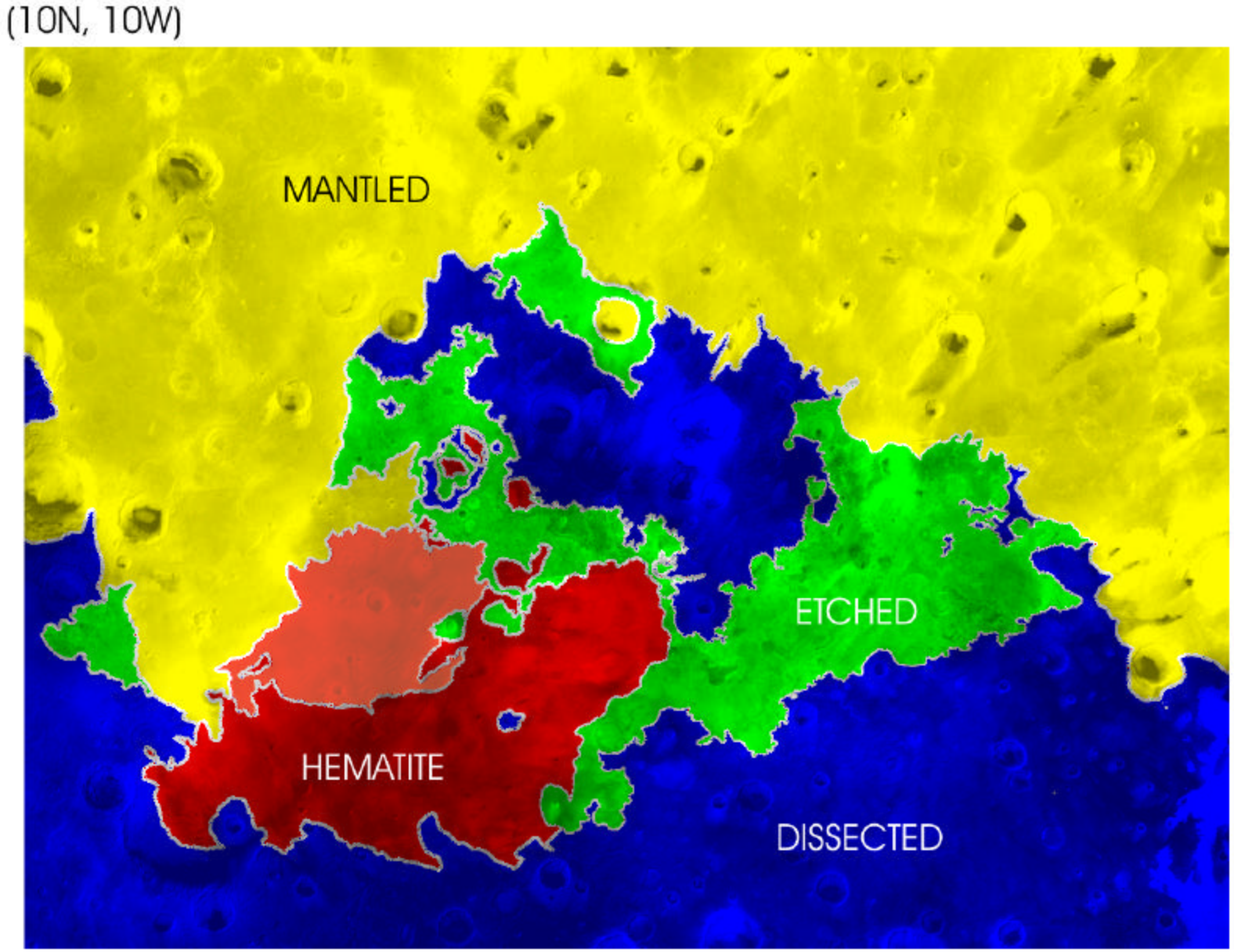
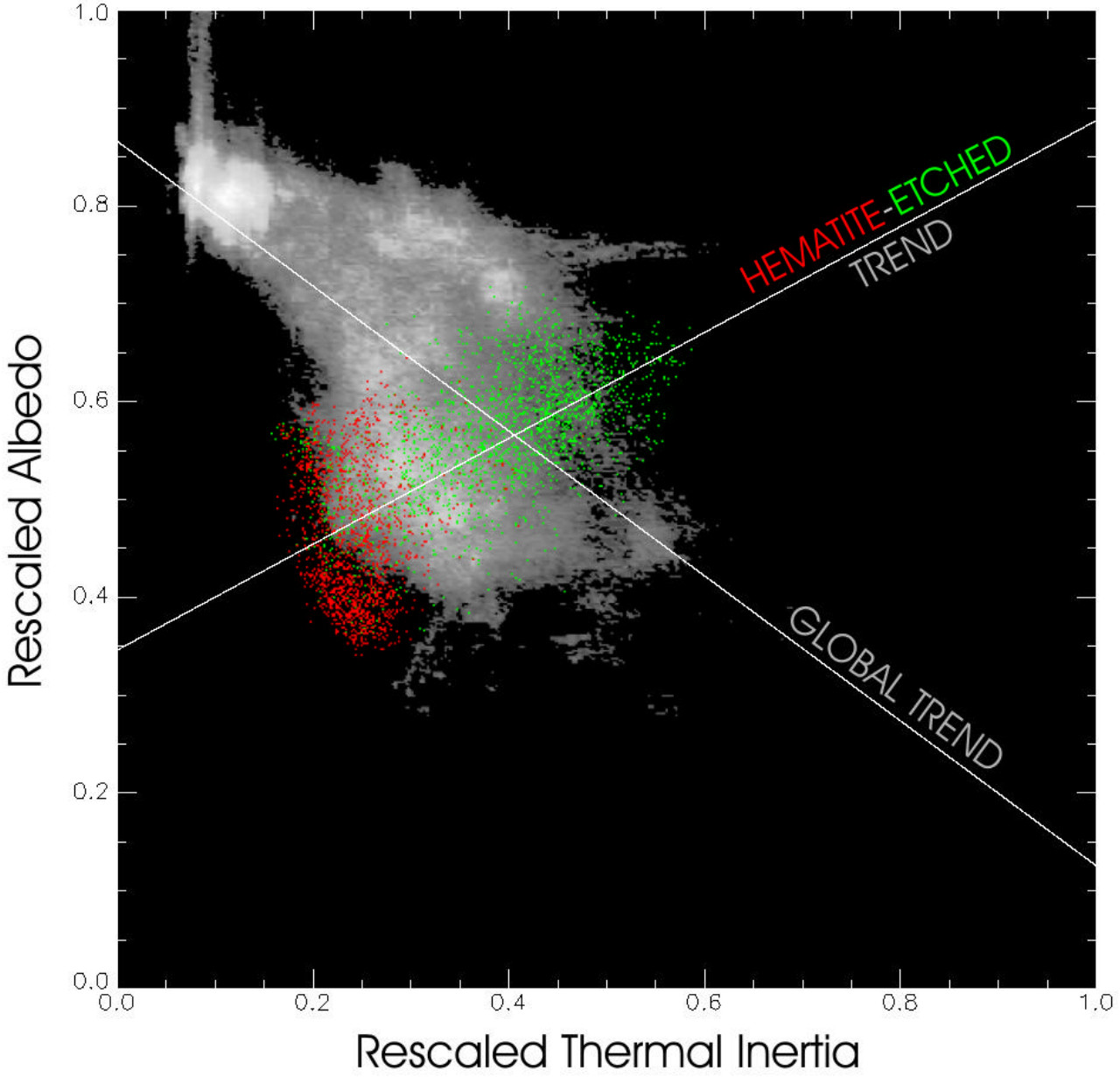
Geologic History

- Dissection of Cratered Terrain
- Deposition of Etched and Hematite layered deposits as volcaniclastic complex (composition?)
- Aqueous and/or hydrothermal alteration of etched and hematite units?
- Mantling by aeolian deposits, with formation of duricrust
- Exhumation by wind leading to hematite and etched unit exposures within landing error ellipse

Terra Meridiani – Map Units

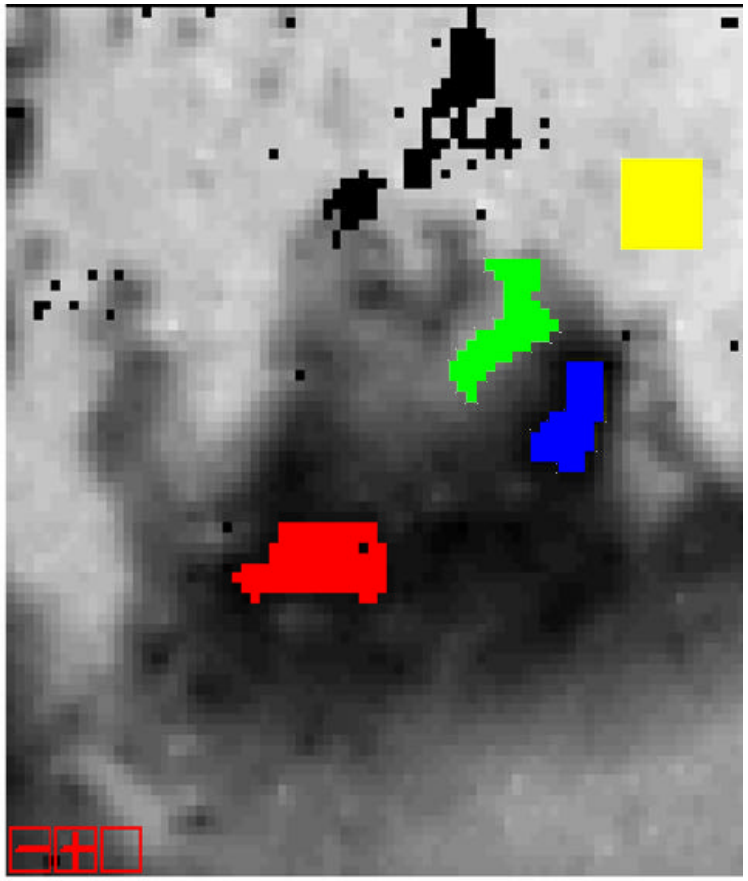


Something Different

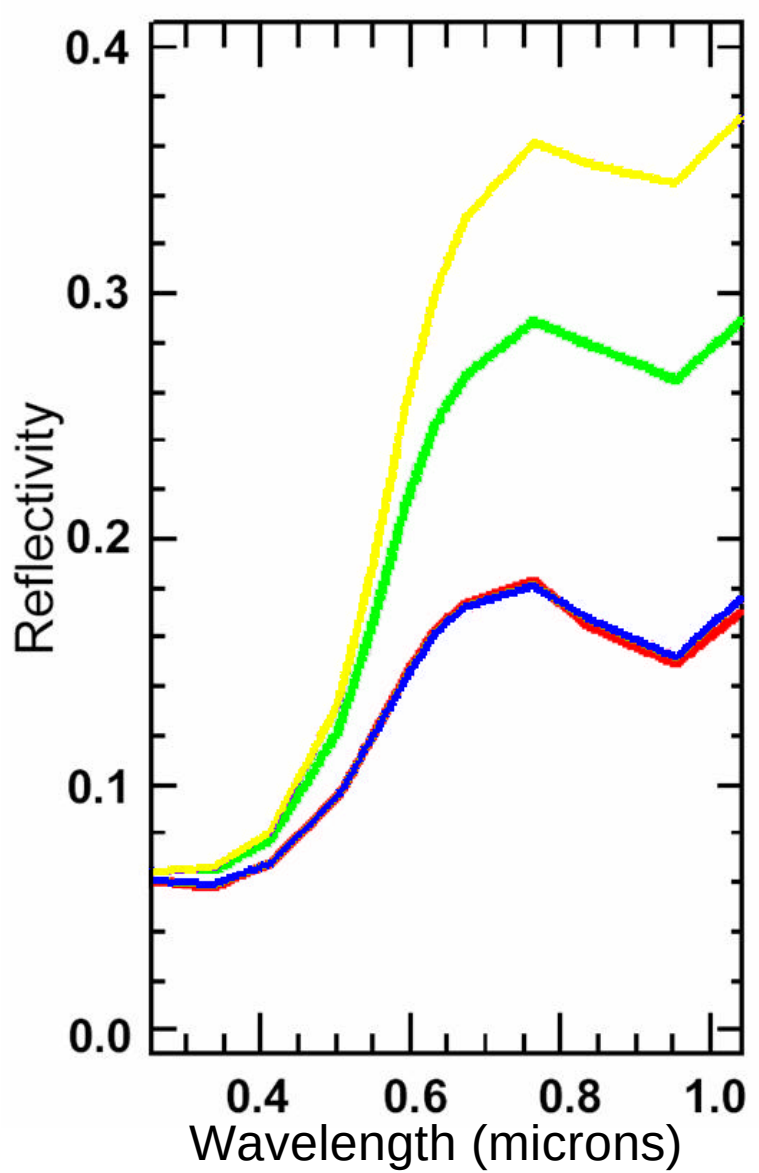


- The Hematite and Etched units run counter to the global Albedo - Thermal Inertia trend.

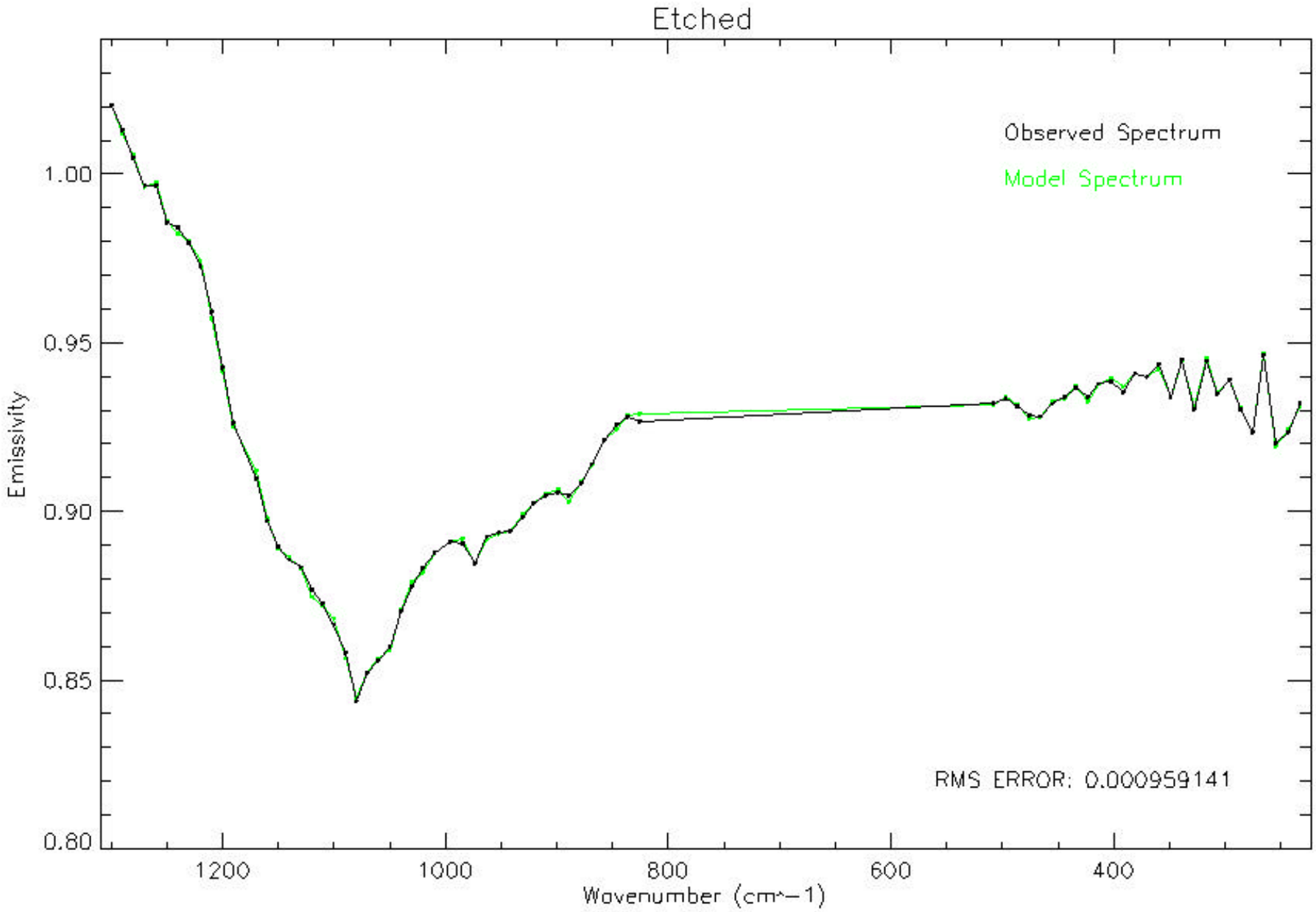
HST Observations of Terra Meridiani



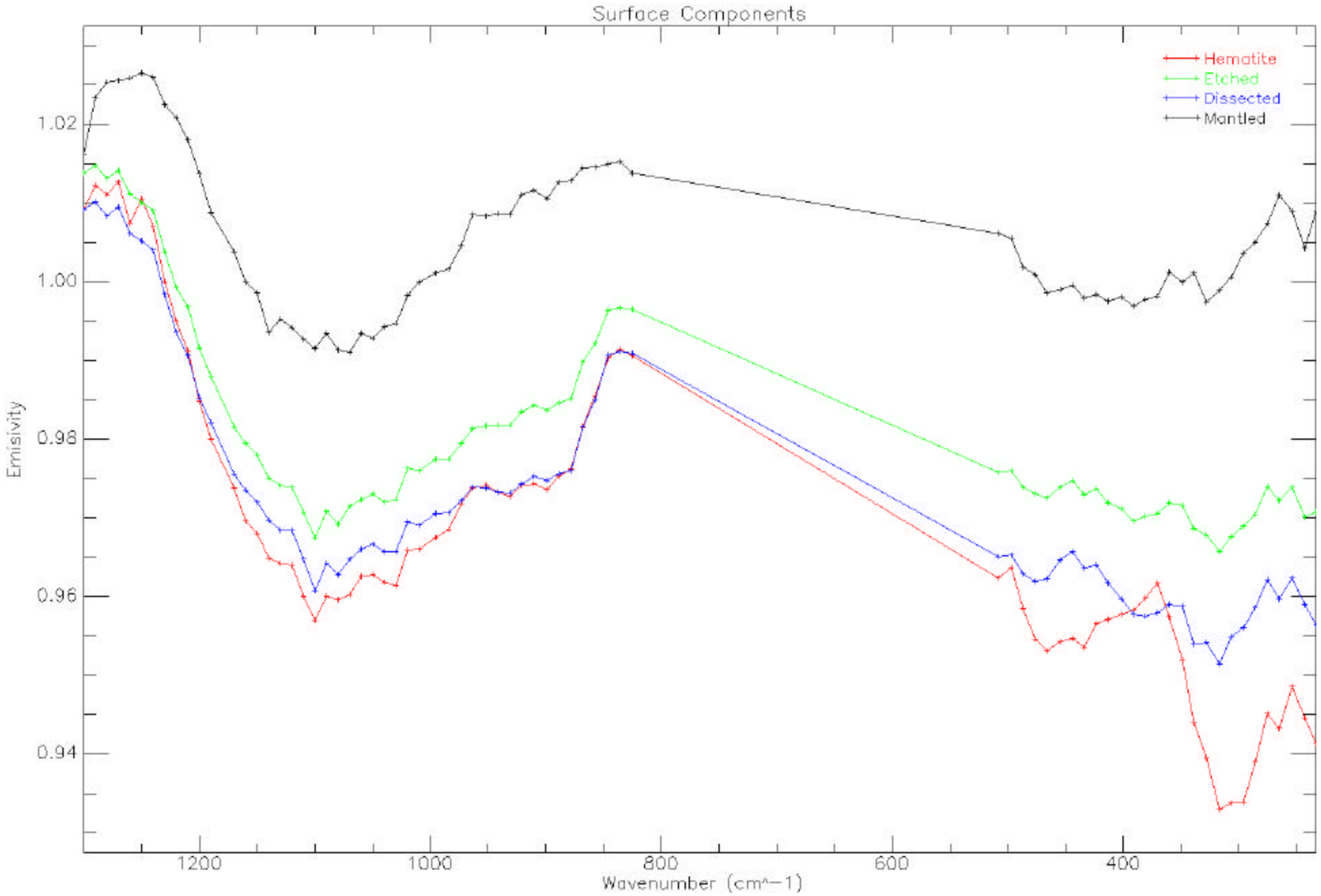
Red = Dark region, gradational with Hematite region
Green = Etched region
Blue = Dark region, no hematite
Yellow = Nearby bright region



Modeling Regional Mean Spectra

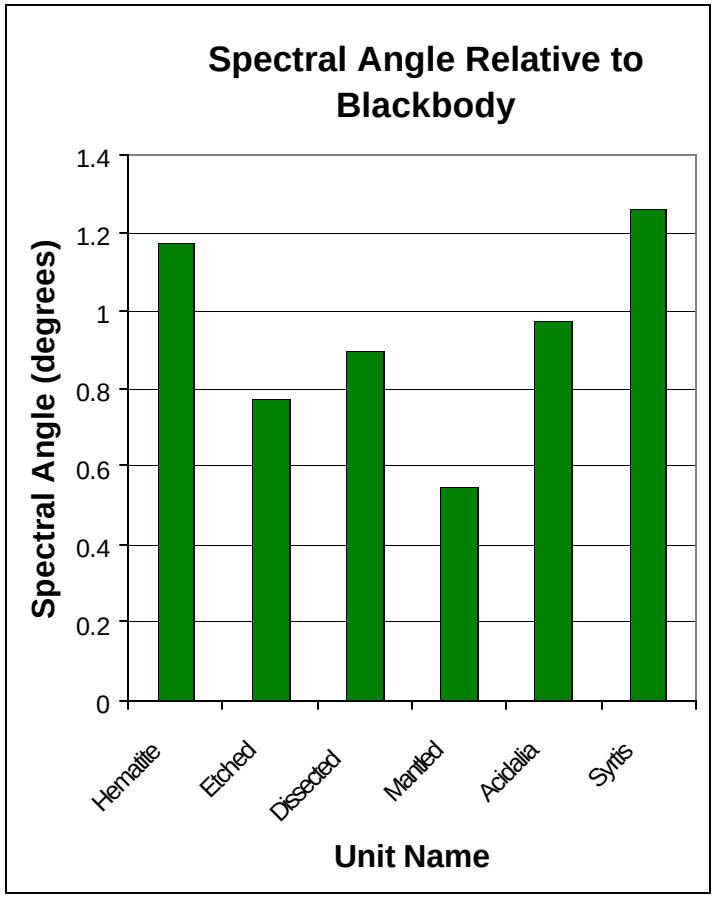


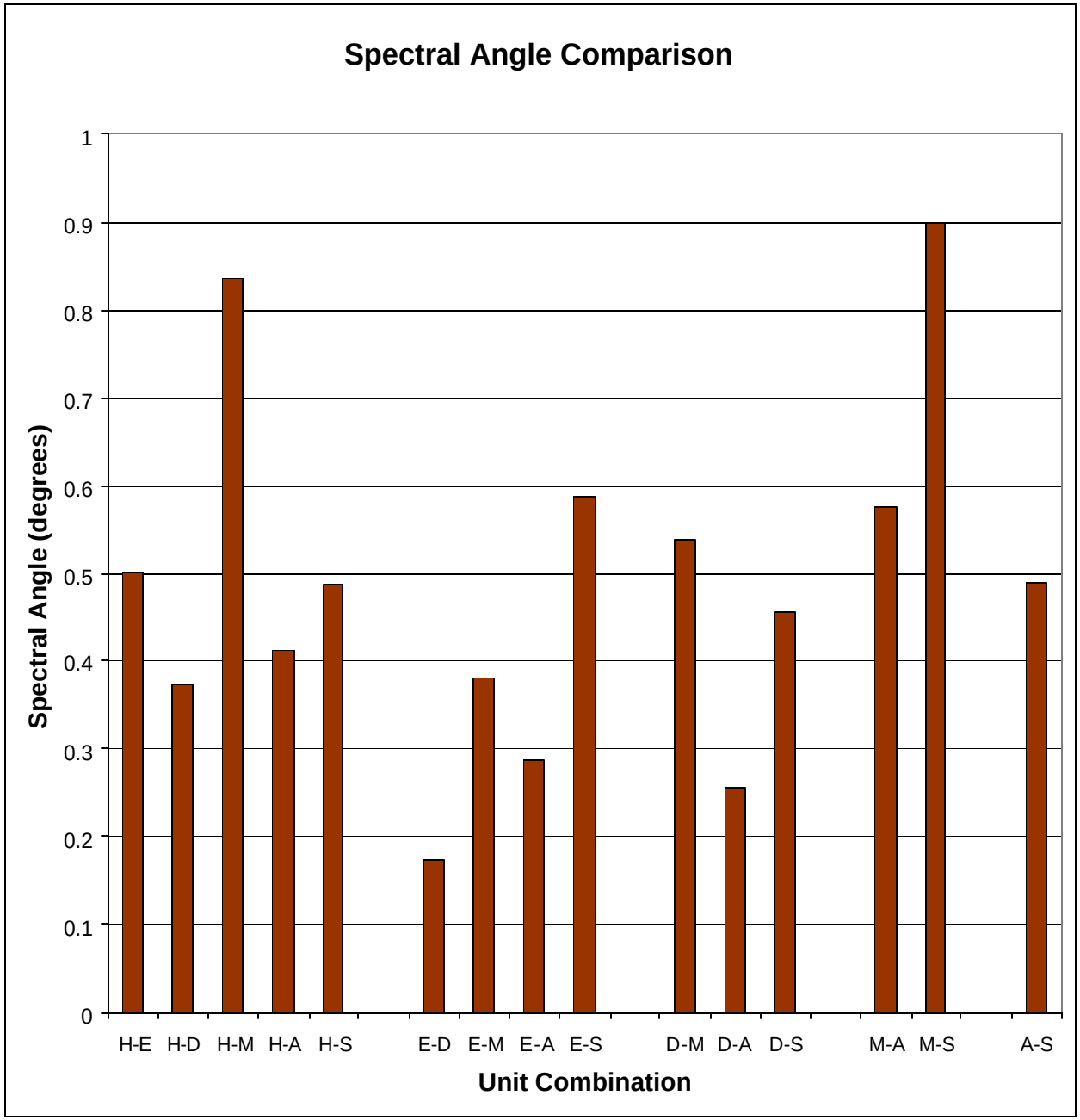
Derived Surface Spectra

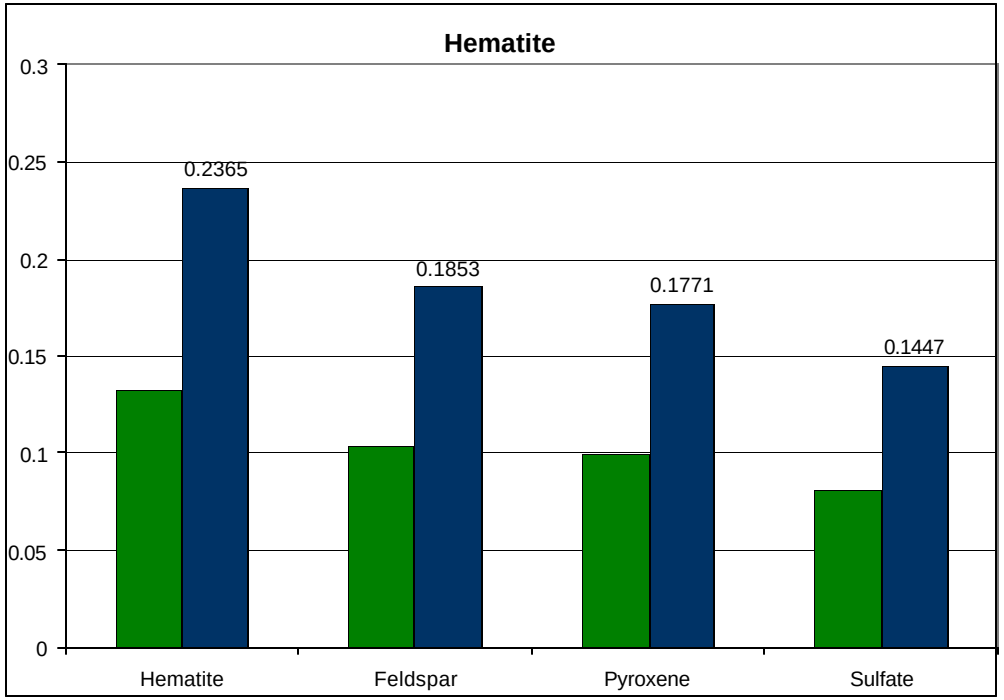


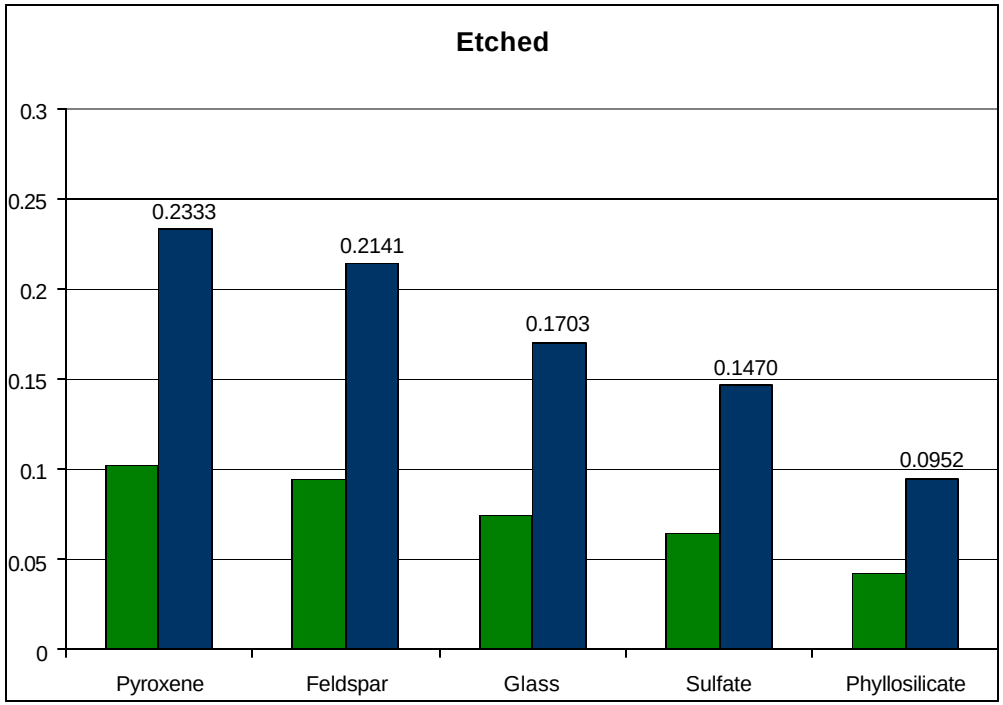
Spectral Angles

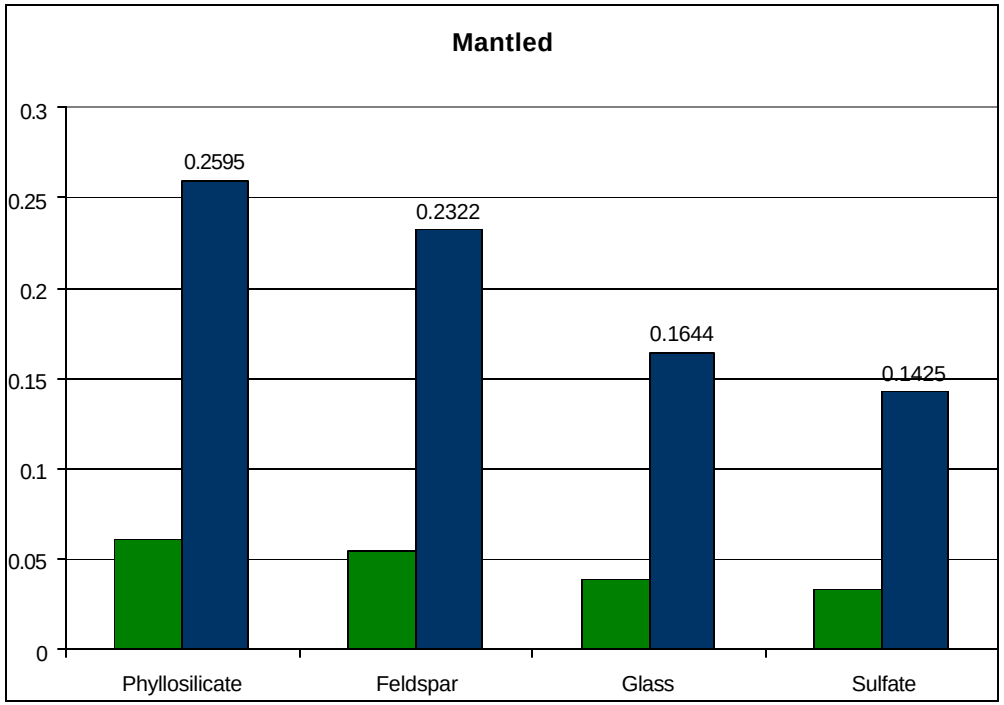
Hematite
Dissected
Acidalia type
Etched
Mantled
Syrtis type

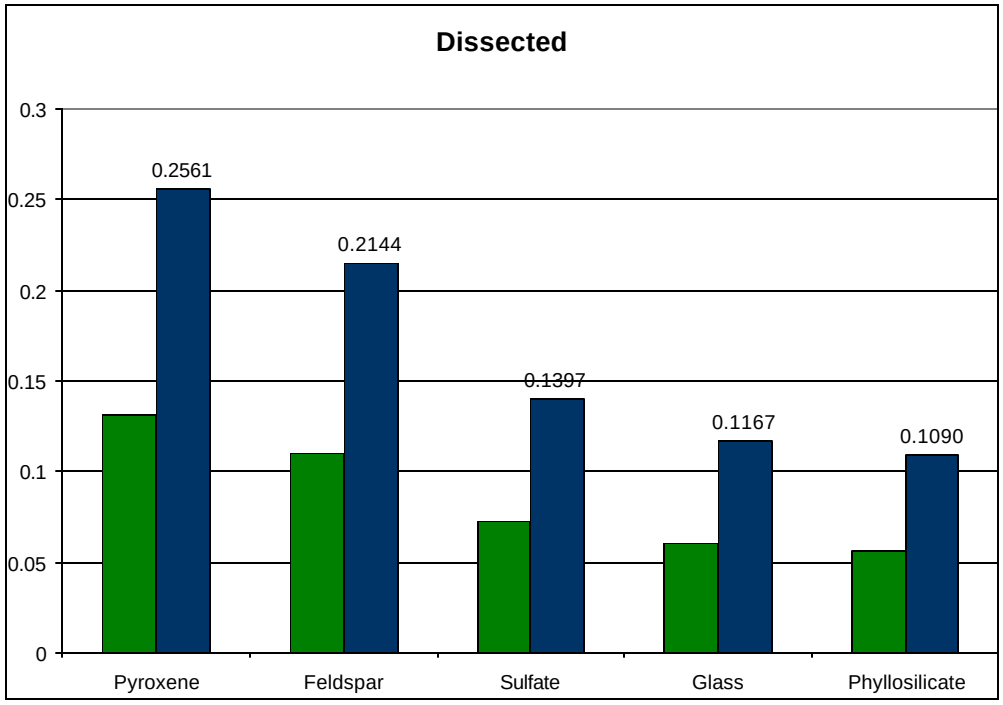





Hematite
0.3
0.25
0.2
0.15
0.1
0.05
0
0.2365
0.1853
0.1771
0.1447
Hematite
Feldspar
Pyroxene
Sulfate

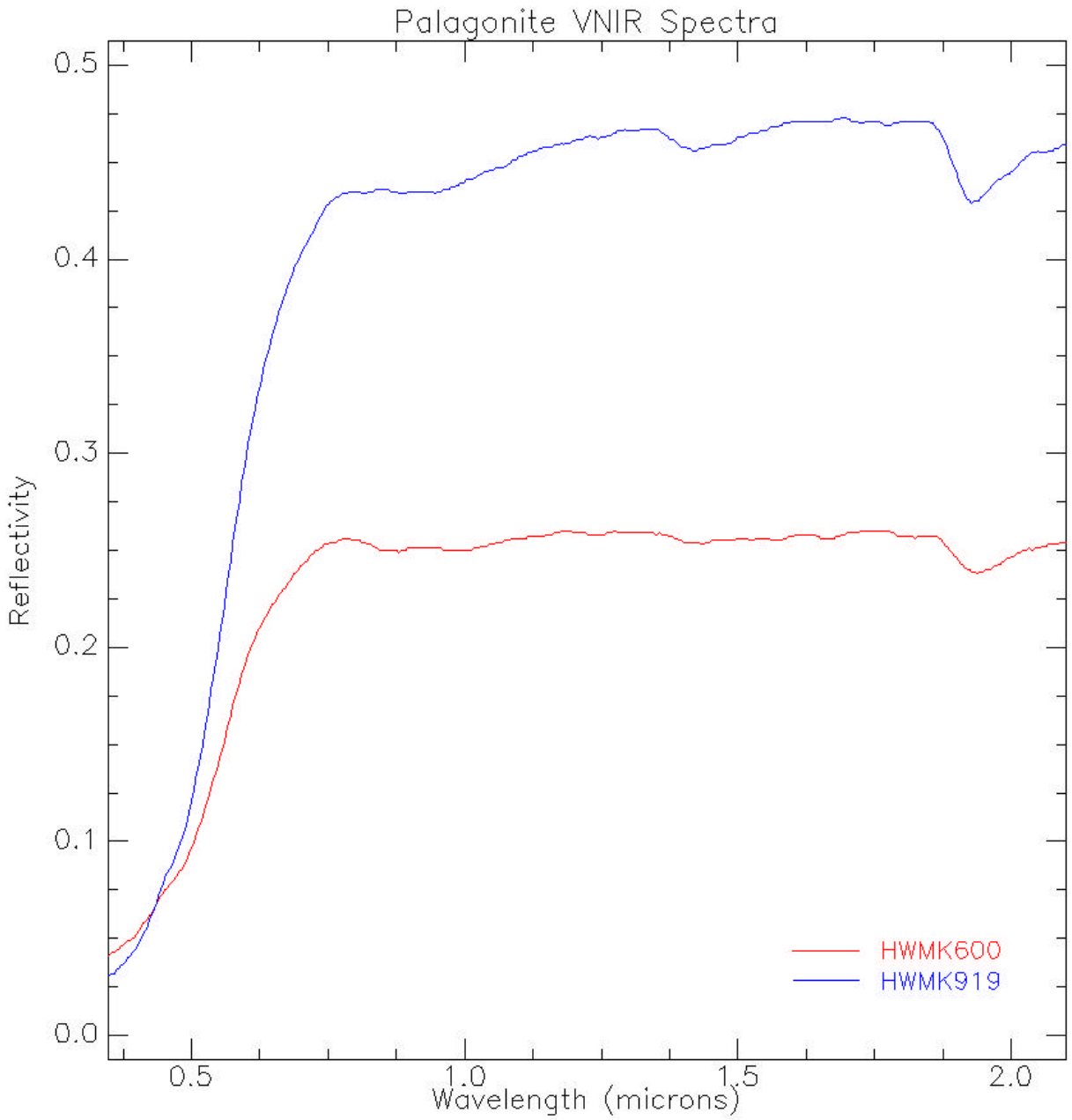

Etched
0.3
0.25
0.2
0.15
0.1
0.05
0
0.2333
0.2141
0.1703
0.1470
0.0952
Pyroxene
Feldspar
Glass
Sulfate
Phyllosilicate


Mantled
0.3
0.25
0.2
0.15
0.1
0.05
0
0.2595
0.2322
0.1644
0.1425
Phyllosilicate
Feldspar
Glass
Sulfate

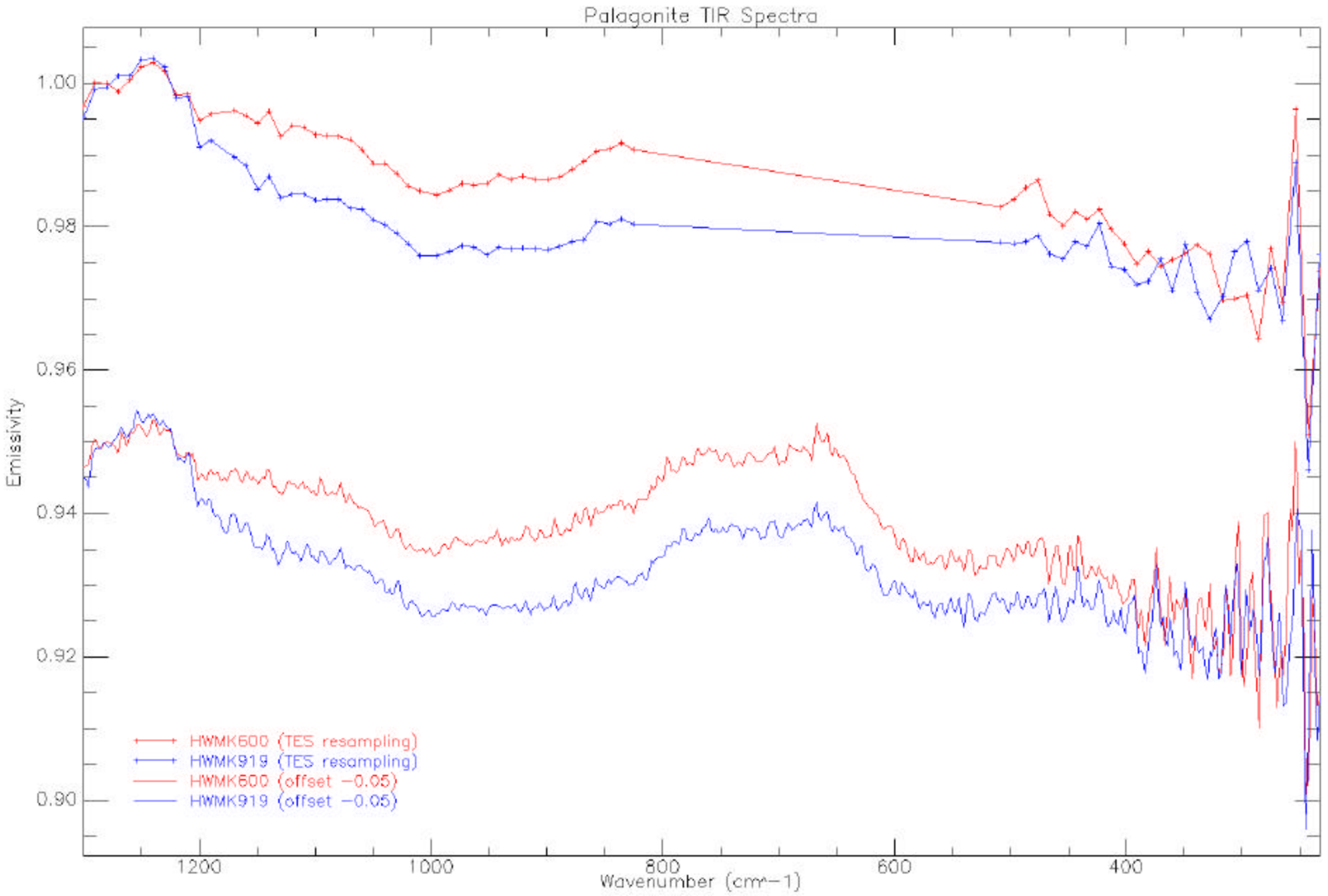

Dissected
0.3
0.25
0.2
0.15
0.1
0.05
0
0.2561
0.2144
0.1397
0.1167
0.1090
Pyroxene
Feldspar
Sulfate
Glass
Phyllosilicate

Palagonite – VNIR Spectra

- Cryptocrystalline material
- Typically a product of basaltic glass devitrification
- Bright (and red) in the VNIR
- Low spectral contrast in the TIR



Palagonite – TIR Spectra



Geologic History

- Dissection of Cratered Terrain.
- Deposition of Etched and Hematite layered deposits as volcaniclastic complex with mafic composition.
- Aqueous and/or hydrothermal alteration of etched deposits (palagonite-like coating). Formation of platy hematite (?)
- Mantling by aeolian deposits, with formation of duricrust.
- Further aqueous and/or hydrothermal alteration to form platy hematite (?)
- Exhumation by wind leading to hematite accumulation in dunes on etched unit exposures within landing error ellipse.

MER: Mast-Mounted Observations

Instrument	Key Parameters	Questions to Address
Mast-Mounted Remote Sensing Package		
Pancam	Twelve bands (0.4 to 1.0 µm) for stereoscopic imaging with 0.3 mrad IFOV; 9.2 deg by 18.4 deg FOV.	Hematite rich dunes on etched substrate? Etched unit exposures show evidence of volcanic emplacement processes?
Mini-TES	Emission spectra (5 to 29 µm, 10 cm-1 resolution) with 8 or 20 mrad FOV	Platy hematite in dunes? Mafic mineralogy? Palagonite-like coatings on etched substrate materials?

MER: Arm-Based Observations

Instrument	Key Parameters	Questions to Address
Arm-Based *In-Situ* Package		
APXS: Alpha Particle X-Ray Spectrometer	^{244}Cm alpha particle sources, and x-ray detectors, 4 cm FOV	Mafic composition? Palagonite-like coatings? Hematite-rich dunes?
MB: Mössbauer Spectrometer	^{57}Fe spectrometer in backscatter mode; Co/Rh source and Si-PIN diode detectors; field of view approximately 1.5 cm^2.	Hematite present in dunes? Other iron-bearing alteration phases? Mafic minerals present? Evidence of palagonite-like coatings?
MI: Microscopic Imager	30 µm/pixel monochromatic imager (1024x1024) with 6mm depth of field	Platy hematite? Coated grains? Volcanic origins?
RAT: Rock Abrasion Tool	Tool capable of preparing 5 mm deep by 4.5 cm wide surface on rocks	Remove coatings and observe fresh igneous minerals?